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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,301	04/27/2004	Daniel J. Farrar	SYB/0099.01	3300

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EXAMINER	
GORTAYO, DANGELINO N	

ART UNIT	PAPER NUMBER
2168	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/709,301	FARRAR ET AL.	
	Examiner	Art Unit	
	Dangelino N. Gortayo	2168	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-24 and 26-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-24 and 26-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In the amendment filed on 10/26/2006, claims 1, 15, 24, and 38 have been amended, claims 2 and 25 have been cancelled, and claims 44-45 have been added. The currently pending claims considered below are Claims 1,3-24 and 26-45.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1,3-24 and 26-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lenzie (US Patent 6,728,720 B1) in view of Zilio et al. (US Patent 7,007,006 B2)

As per claim 1, Lenzie teaches "In a database system having an optimizer for generating an access plan for processing a given database query, an optimizer-based method for recommending database indexes to be created for optimizing system performance, the method comprising:" (see Abstract)

"capturing a workload representative of database queries employed during system use;" (column 5 lines 17-22, wherein a copy is made of all the SQL queries supplied to the engine over a selected period of time)

"based on indexes sought by the optimizer during generation of access plans for said database queries, creating virtual indexes for optimizing system performance during execution of the database queries captured in the workload," (column 5 lines 22-28 and column 8 lines 8-13, wherein an index optimizer creates a set of preferred indexes for a database) "wherein each said virtual index comprises an in-memory data structure corresponding to a set of potential physical indexes;" (Figure 16-19 and column 11 lines 1-53, wherein an indexable predicate set is used to create a combined index made up of sets of indexes)

"and recommending physical indexes to be created based on virtual indexes that have favorable cost benefits for the captured workload." (column 12 lines 53-59, wherein an index with the highest cost saving is selected)

Lenzie does not teach "computing cost benefits for different combinations of the virtual indexes by re-optimizing the workload multiple times, each time eliminating less-beneficial indexes from consideration". Zilio teaches "computing cost benefits for different combinations of the virtual indexes by re-optimizing the workload multiple times, each time eliminating less-beneficial indexes from consideration;" (figure 1 reference 7 and 14, column 7 line 57 – column 8 line 3, column 9 line 20 – column 10 line 44, and column 12 lines 47-57, wherein candidate indexes are evaluated in a workload through iterations, and less efficient materialized views, including indexes, are swapped out). It would have been obvious for one of ordinary skill in the art at the time of the invention to combine Lenzie's method for selecting optimal, more efficient indexes in a database with Zilio's method of iterating through a workload of candidate indexes,

identifying the more efficient indexes in a database. This gives the user the advantage of processing multiple indexes in sets when identifying optimal indexes. The motivation for doing so is automate the process of choosing more efficient indexes, leading to better overall performance for a user's database workload (column 1 line 16-25).

As per claim 3, Lenzie teaches "the capturing step includes: displaying a screen input button that a user may invoke to record a usage session as a workload." (column 9 lines 7-16, wherein a user invokes the testing using representative data)

As per claim 4, Lenzie teaches "the workload represents user execution of a database application with a typical workload that is contemplated for the application." (column 8 line 63 – column 9 line 6, wherein up-to-date statistics are kept for the database queries)

As per claim 5, Lenzie teaches "the workload includes information recording text of all the queries operating during the capture of the workload." (column 9 lines 24-30)

As per claim 6, Lenzie teaches "the workload includes information recording settings for certain options that affect how queries are optimized." (column 8 lines 8-16)

As per claim 7, Lenzie teaches "the capturing step includes: capturing information about a set of workloads to define a problem instance." (column 9 lines 41-54)

As per claim 8, Lenzie teaches " setting a limit on how much disk space is available for physical indexes." (column 9 lines 55-61, wherein the size of the tables is limited)

As per claim 9, Lenzie teaches "the recommending step takes into account the limit on disk space available for physical indexes." (column 5 lines 10-16)

As per claim 10, Lenzie teaches "the recommending step includes: if the physical indexes to be recommended for creation exceed the limit on disk space available for physical indexes, removing some of the physical indexes from consideration." (column 12 lines 33-52, wherein index maintenance is done)

As per claim 11, Lenzie teaches "the physical indexes removed from consideration are ones having less favorable cost benefits for the captured workload." (column 13 lines 57-67)

As per claim 12, Lenzie teaches "the physical indexes removed from consideration comprise at least 20 percent of bottom performing indexes considered for recommendation." (column 13 lines 31-47)

As per claim 13, Lenzie teaches "specifying whether certain types of indexes should be considered at all." (column 14 lines 1-9)

As per claim 14, Lenzie teaches "the creating virtual indexes step includes: searching for relevant indexes that will help the system's optimizer use sargable predicates for partial index scans." (column 14 lines 1-6, wherein a preferred index set based on recorded patterns of user queries is index searchable)

As per claim 15, Lenzie teaches "an index consultant creates virtual indexes without specifying ordering of columns used in sargable equality predicates." (column 11 lines 53-65)

As per claim 16, Lenzie teaches "the creating virtual indexes step includes: searching for relevant indexes that will help provide useful orderings." (column 12 line 60 – column 13 line 4, wherein preferred indexes are searched for ordering)

As per claim 17, Lenzie teaches "columns of virtual indexes may be order-independent "don't care" columns that satisfy some interesting ordering wish list of the system's optimizer." (column 13 line 5-18)

As per claim 18, Lenzie teaches "columns of virtual indexes may have an unspecified sortedness." (column 13 line 19-22)

As per claim 19, Lenzie teaches "collapsing some of the virtual indexes together, if feasible for the workload." (column 11 lines 31-41, column 13 lines 48-56)

As per claim 20, Lenzie teaches "the collapsing step includes: identifying that columns of one virtual index are a superset of another the columns of another virtual index, and that both indexes may be combined into a single virtual index that is feasible for the workload;" (column 13 lines 38-43)

"and identifying that sortedness of a column of a virtual index, if unspecified, may be specified to allow it to be combined with an index with identical columns but specified sortedness;" (column 13 lines 42-47)

"and identifying that a virtual index that has columns of opposite sortedness of a second virtual index, and that both indexes may be combined into a single virtual index." (column 13 lines 48-56)

As per claim 21, Lenzie teaches "polling periodically in the method to ensure that the system is working with accurate cost information." (column 5 lines 29-33, wherein a user is polled about system performance)

As per claim 22, Lenzie is disclosed as per claim 1 above. Additionally, Lenzie teaches "A computer-readable medium having processor-executable instructions" (column 4 lines 15-23)

As per claim 23, Lenzie is disclosed as per claim 1 above. Additionally, Lenzie teaches "A downloadable set of processor-executable instructions" (column 4 lines 15-23)

As per claim 24, Lenzie teaches "A system that recommends database indexes to be created for optimizing system performance, the system comprising:" (see Abstract)

"a database system that executes database queries, said database system having an optimizer for generating an access plan for processing each given database query;" (Figure 3 reference 315, column 4 lines 43-50, column 5 lines 22-28)

"and an optimizer-based index consultant for capturing a workload representative of database queries executed during typical system use;" (column 5 lines 17-22, wherein a copy is made of all the SQL queries supplied to the engine over a selected period of time)

"creating, based on indexes sought by the optimizer during generation of access plans for said database queries, virtual indexes for optimizing system performance

during execution of the database queries captured in the workload," (column 5 lines 22-28 and column 8 lines 8-13, wherein an index optimizer creates a set of preferred indexes for a database) "wherein each said virtual index comprises an in-memory data structure corresponding to a set of potential physical indexes;" (Figure 16-19 and column 11 lines 1-53, wherein an indexable predicate set is used to create a combined index made up of sets of indexes)

"and recommending physical indexes to be created based on virtual indexes that have favorable cost benefits for the captured workload." (column 12 lines 53-59, wherein an index with the highest cost saving is selected)

Lenzie does not teach "computing cost benefits for different combinations of the virtual indexes by re-optimizing the workload multiple times, each time eliminating less-beneficial indexes from consideration". Zilio teaches "computing cost benefits for different combinations of the virtual indexes by re-optimizing the workload multiple times, each time eliminating less-beneficial indexes from consideration;" (figure 1 reference 7 and 14, column 7 line 57 – column 8 line 3, column 9 line 20 – column 10 line 44, and column 12 lines 47-57, wherein candidate indexes are evaluated in a workload through iterations, and less efficient materialized views, including indexes, are swapped out). It would have been obvious for one of ordinary skill in the art at the time of the invention to combine Lenzie's method for selecting optimal, more efficient indexes in a database with Zilio's method of iterating through a workload of candidate indexes, identifying the more efficient indexes in a database. This gives the user the advantage of processing multiple indexes in sets when identifying optimal indexes. The motivation

for doing so is automate the process of choosing more efficient indexes, leading to better overall performance for a user's database workload (column 1 line 16-25).

As per claim 26, Lenzie teaches "the index consultant displays a screen input button that a user may invoke to record a usage session as a workload." (column 9 lines 7-16, wherein a user invokes the testing using representative data)

As per claim 27, Lenzie teaches "the workload represents user execution of a database application with a typical workload that is contemplated for the application." (column 8 line 63 – column 9 line 6, wherein up-to-date statistics are kept for the database queries)

As per claim 28, Lenzie teaches "the workload includes information recording text of all the queries operating during the capture of the workload." (column 9 lines 24-30)

As per claim 29, Lenzie teaches "the workload includes information recording settings for certain options that affect how queries are optimized." (column 8 lines 8-16)

As per claim 30, Lenzie teaches "the index consultant captures information about a set of workloads to define a problem instance." (column 9 lines 41-54)

As per claim 31, Lenzie teaches " the index consultant may receive information specifying a limit on how much disk space is available for physical indexes." (column 9 lines 55-61, wherein the size of the tables is limited)

As per claim 32, Lenzie teaches "the index consultant takes into account the limit on disk space available for physical indexes." (column 5 lines 10-16)

As per claim 33, Lenzie teaches "the index consultant removes some of the physical indexes from consideration, when sufficient disk space is unavailable." (column 12 lines 33-52, wherein index maintenance is done)

As per claim 34, Lenzie teaches "the physical indexes removed from consideration are ones having less favorable cost benefits for the captured workload." (column 13 lines 57-67)

As per claim 35, Lenzie teaches "the physical indexes removed from consideration comprise at least 20 percent of bottom performing indexes considered for recommendation." (column 13 lines 31-47)

As per claim 36, Lenzie teaches "the index consultant allows user input specifying whether certain types of indexes should be considered at all." (column 14 lines 1-9)

As per claim 37, Lenzie teaches "the index consultant searches for relevant indexes that will help the system's optimizer use sargable predicates for partial index scans." (column 14 lines 1-6, wherein a preferred index set based on recorded patterns of user queries is index searchable)

As per claim 38, Lenzie teaches "the index consultant creates virtual indexes without specifying ordering of columns used in sargable equality predicates." (column 11 lines 53-65)

As per claim 39, Lenzie teaches "the index consultant searches for relevant indexes that will help provide useful interesting (order or grouping) properties." (column 12 line 60 – column 13 line 4, wherein preferred indexes are searched for ordering)

As per claim 40, Lenzie teaches "columns of indexes created may reflect order-independent "don't care" columns that satisfy some interesting ordering wish lists of the system's optimizer." (column 13 line 5-18)

As per claim 41, Lenzie teaches "the index consultant attempts to collapse some of the virtual indexes together, if feasible for the workload." (column 11 lines 31-41, column 13 lines 48-56)

As per claim 42, Lenzie teaches "the index consultant attempts to identify that columns of one index are a superset of the columns of another index, and that both indexes may be combined into a single index that is feasible for the workload." (column 13 lines 38-56)

As per claim 43, Lenzie teaches "operation of the index consultant may be polled during operation to ensure that the system is working with accurate cost information." (column 5 lines 29-33, wherein a user is polled about system performance).

As per claim 44, Lenzie teaches "the virtual indexes are created by an index consultant that observes the optimizer's need for certain indexes during generation of access plans for said database queries." (Figure 12 reference 1205, column 9 lines 7-23, and column 10 lines 12-18)

As per claim 45, Lenzie teaches "the index consultant creates the virtual indexes by observing the optimizer's need for certain indexes during generation of access plans for said database queries." (Figure 12 reference 1205, column 9 lines 7-23, and column 10 lines 12-18)

Response to Arguments

4. Applicant's arguments, see page 11, filed 10/26/2006, with respect to the 35 USC 102(b) rejection, have been fully considered but they are not persuasive.

a. Applicant's argument is stated as Lenzie does not teach an optimizer-based approach where each virtual index to represent a set or class of potential physical indexes.

In regards to the argument, Examiner respectfully disagrees. As stated in the rejection above, Lenzie teaches an indexable predicate set that is used to create a combined index made up of sets of indexes in Figure 16-19 and column 11 lines 1-53. Using an indexable predicate set and the select list, a combined index can be created that combines a group of indexes. More specifically, the combined index of Lenzie is created from various indexes, combined from different indexes or lists. These groups of indexes are a result of optimization and are left at a later step to determine cost benefits. Each combined index is also associated with a set of lists, satisfying the limitation that a virtual index represent a set or class of potential indexes. Additionally, the use of the term "potential" in the claim (line 10) leaves questions as to the threshold range of indexes, not being specific enough. The combined index could represent just one index, if only one physical index is potentially created at a later step. Therefore, Lenzie teaches an optimizer-based approach where each virtual index to represent a set or class of potential physical indexes.

b. Applicant's argument is stated as Lenzie does not teach that any modifications made in the optimizer do not affect the Index Consultant.

In regards to the argument, Examiner respectfully disagrees. This limitation is not specifically stated in the claims and is absent. Therefore, the limitation does not need to be taught by the prior art of record.

c. Applicant's argument is stated as Lenzie does not teach that Index Consultant collapses its candidate virtual indexes at the end of the process.

In regards to the argument, Examiner respectfully disagrees. "Collapsing virtual indexes" as a term does not appear till claim 19, and refers to combining some indexes, which Lenzie teaches in column 11 lines 31-41, wherein a combined index is created. Additionally, 'if feasible for the workload' denotes an optionally recited limitation and optionally recited limitations are not guaranteed to take place and are therefore not required to be taught, see MPEP § 2106 Section II(C))

d. Applicant's argument is stated as Lenzie does not teach watching the optimizer, as opposed to simply looking at the syntax of a query, as in claims 44 and 45.

In regards to the argument, Examiner respectfully disagrees. Lenzie teaches analysis of traced data, and that a trial database copies statistics of the

live main database, observing and cutting down in the time required for optimization in Figure 12 reference 1205, column 9 lines 7-23, and column 10 lines 12-18. The trial database uses a sample of the main database, and examines the data when the data is being executed. Therefore, Lenzie teaches watching the optimizer, as opposed to simply looking at the syntax of a query.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dangelino N. Gortayo whose telephone number is (571)272-7204. The examiner can normally be reached on M-F 7:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim T. Vo can be reached on (571)272-3642. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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